TRANSMITTAL OF FORMAL DRAWINGS

Docket No.
907B.0004.USU

In Re Application Of: **HALL et al**
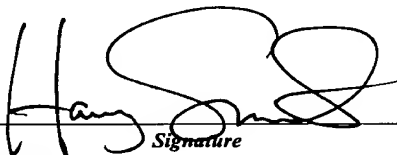
Serial No.	Filing Date	Batch No.	Examiner	Art Unit
09/833,720	April 12, 2001	Unknown	Unknown	2661

Invention: **Hybrid Synchronous Space/Code Multiple Access System using An Adaptive Antenna System**

Address to:
Assistant Commissioner for Patents
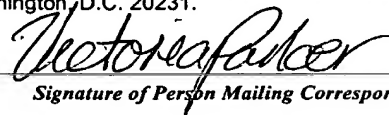**Washington, D.C. 20231**

Transmitted herewith are:

   6   sheets of formal drawing(s) for this application.

Each sheet of drawing indicates the identifying indicia suggested in 37 CFR Section 1.84(c)
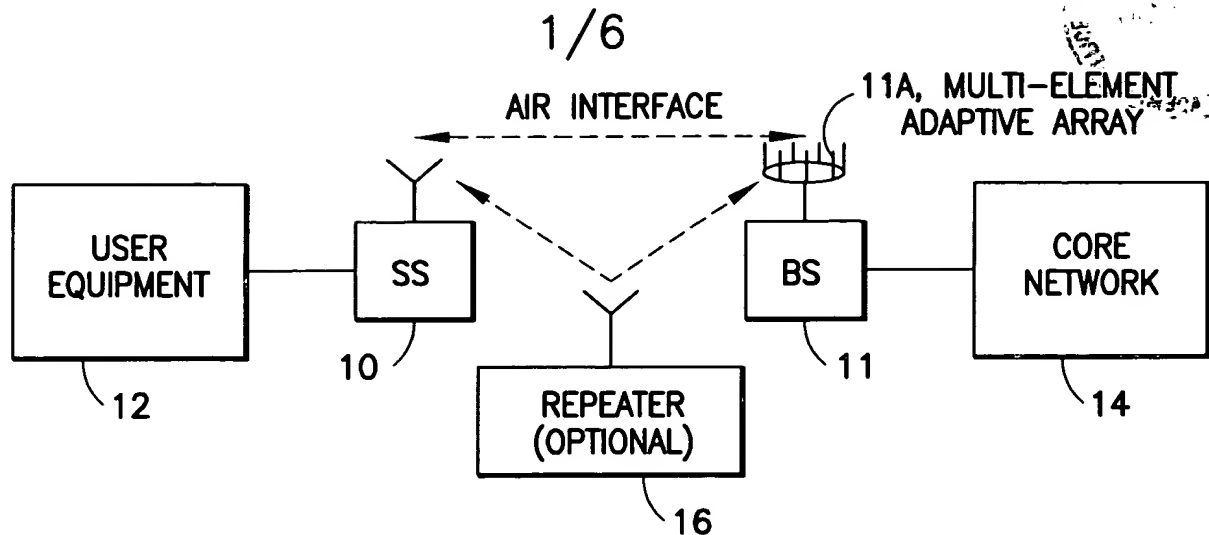on the reverse side of the drawing.

Dated: **November 27, 2001**

_____
Signature

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P23B/REV01

AIR INTERFACE

11A, MULTI-ELEMENT
ADAPTIVE ARRAY

| USER EQUIPMENT | SS | BS | CORE NETWORK |

REPEATER
(OPTIONAL)

FIG.1 WIRELESS ACCESS REFERENCE MODEL

20

| ECC ENCODER | SCRAMBLING | MODULATION | PULSE SHAPING/ PRE-EQUALIZATION |

SS/BS TRANSMITTER

| ECC DECODER | DESCRAMBLING | DEMODULATION | MATCHED FILTER/ EQUALIZATION |

BS/SS RECEIVER

30
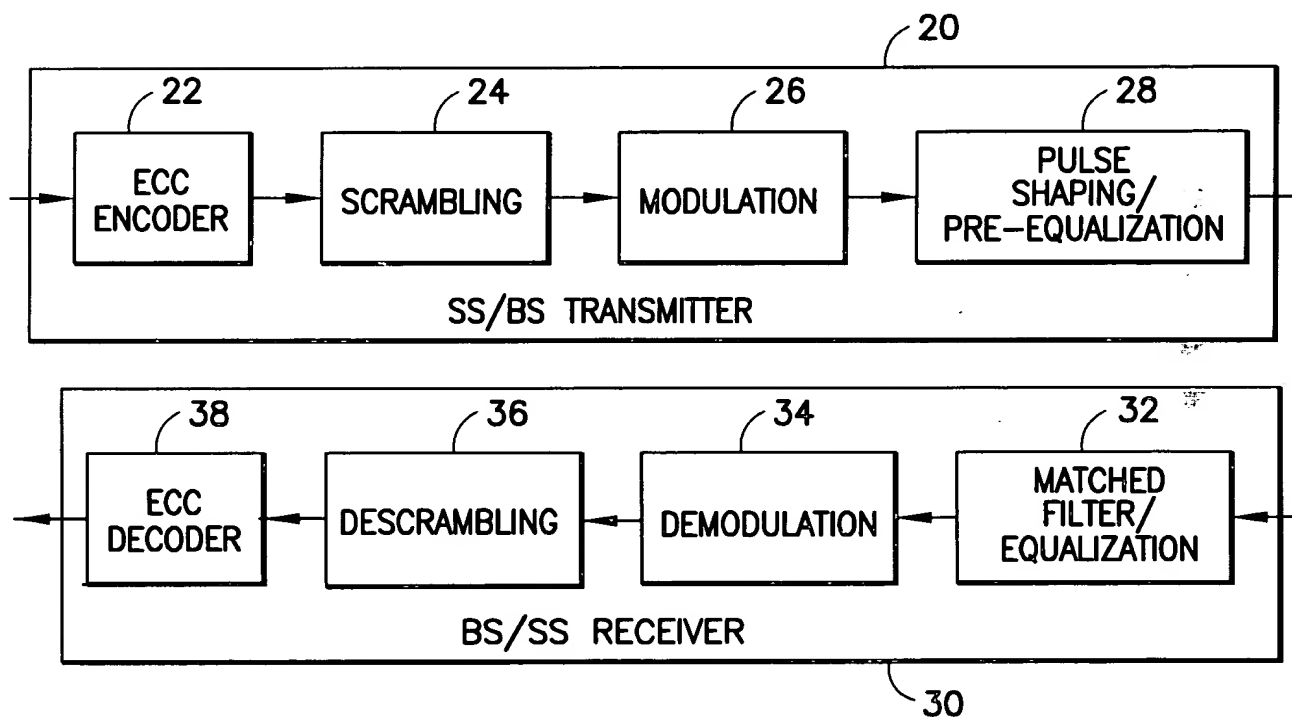
FIG.2 PHY REFERENCE MODEL SHOWING DATA FLOW

| CC/TURBO ENCODER | PUNCTURE BLOCK | XOR |

TO MODULATOR 26

RANDOMIZING CODE
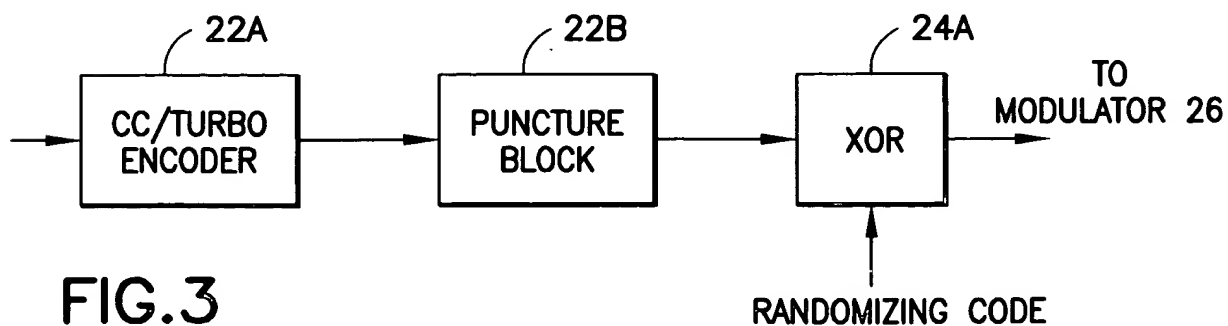
FIG.3
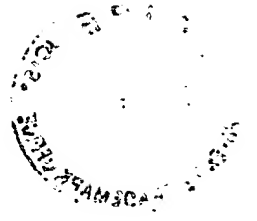
PARAMETER	MODULATION AND CHANNEL CODING		
	QPSK w/R=4/5 CODING (1.6 BITS/SYM)	16-QAM w/R=4/5 CODING (3.2 BITS/SYM)	64-QAM w/R=4/5 CODING (4.8 BITS/SYM)
RF CHANNEL BANDWIDTH	3.5 MHz	3.5 MHz	3.5 MHz
CHIP RATE	2.56 Mcps	2.56 Mcps	2.56 Mcps
COMMUNICATION CHANNEL BANDWIDTH	4.096 Mbps	8.192 Mbps	12.288 Mbps
PEAK DATA RATE	4.096 Mbps	8.192 Mbps	12.288 Mbps
CDMA CHANNEL BANDWIDTH (SF=1)	4.096 Mbps	8.192 Mbps	12.288 Mbps
CDMA CHANNEL BANDWIDTH (SF=16)	256 kbps	512 kbps	768 kbps
CDMA CHANNEL BANDWIDTH (SF=128)	32 kbps	64 kbps	96 kbps
MODULATION FACTOR	1.17 bps/Hz	2.34 bps/Hz	3.511 bps/Hz

FIG.4 HYPOTHETICAL PARAMETERS FOR A 3.5 MHz RF CHANNELIZATION

NUMBER OF ELEMENTS	QPSK		16 QAM		64 QAM	
	AGGREGATE CAPACITY (Mbps)	MODULATION FACTOR	AGGREGATE CAPACITY (Mbps)	MODULATION FACTOR	AGGREGATE CAPACITY (Mbps)	MODULATION FACTOR
1	4.096	1.17	8.192	2.34	12.288	3.511
2	8.192	2.34	16.384	4.68	24.576	7.022
4	16.384	4.68	32.768	9.36	49.152	14.044
8	32.768	9.36	65.536	18.72	98.304	28.088
16	65.536	18.72	131.072	37.44	196.608	56.176

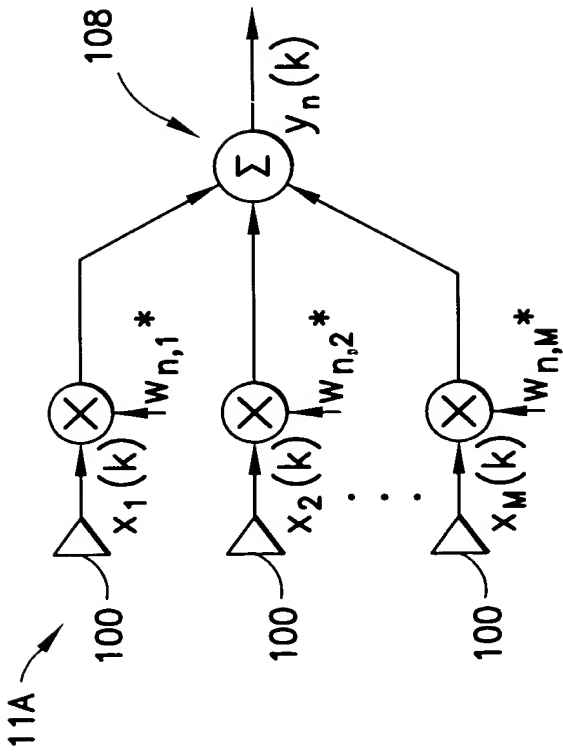FIG.5 AGGREGATE CAPACITY AND MODULATION FACTORS VERSUS MODULATION TYPE AND ARRAY SIZE

$$y_n(t) = \begin{bmatrix} w^*_{n,1} & w^*_{n,2} & \cdots & w^*_{n,M} \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ \vdots \\ x_M(t) \end{bmatrix}$$

FIG.6B

FIG.6A

FIG.7
PRIOR ART

ANTENNA
ELEMENTS

$x_1(k)$ $c_n(k)$ → ACCUMULATE OVER BIT DURATION → SPATIAL FILTER FOR USER 1 → TO DECISION DEVICE

$x_2(k)$ $c_n(k)$ → ACCUMULATE OVER BIT DURATION → SPATIAL FILTER FOR USER 2 → TO DECISION DEVICE

$x_M(k)$ $c_n(k)$ → ACCUMULATE OVER BIT DURATION → SPATIAL FILTER FOR USER K → TO DECISION DEVICE

100 102 104 106 108

M

FIG.8

ANTENNA
ELEMENTS

SPREADER
SPATIAL
FILTER

100

$x_1(k)$

$c_n(k)$

110

$w_{n,1}^*$

108

$x_2(k)$

$c_n(k)$

$w_{n,2}^*$

$x_M(k)$

$c_n(k)$

$w_{n,M}^*$

· · · ·

SIGNAL
MODULATOR

26

$c_n(k)$

FIG.9
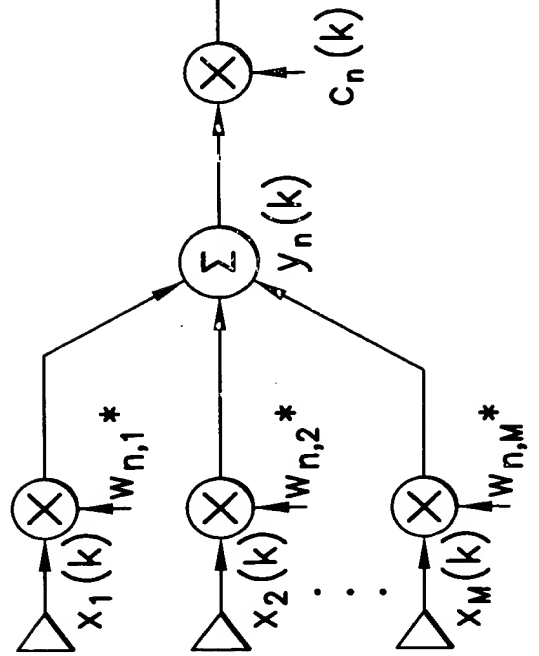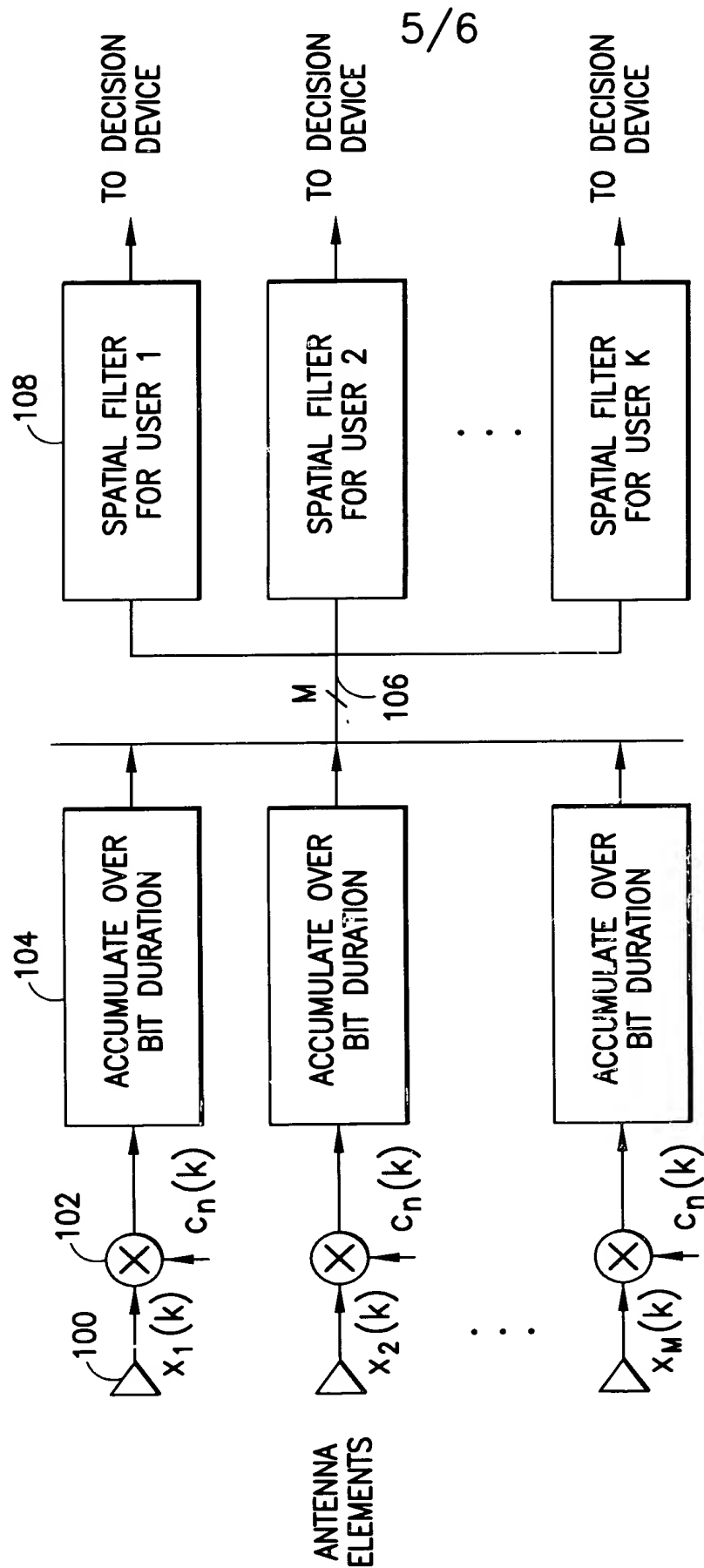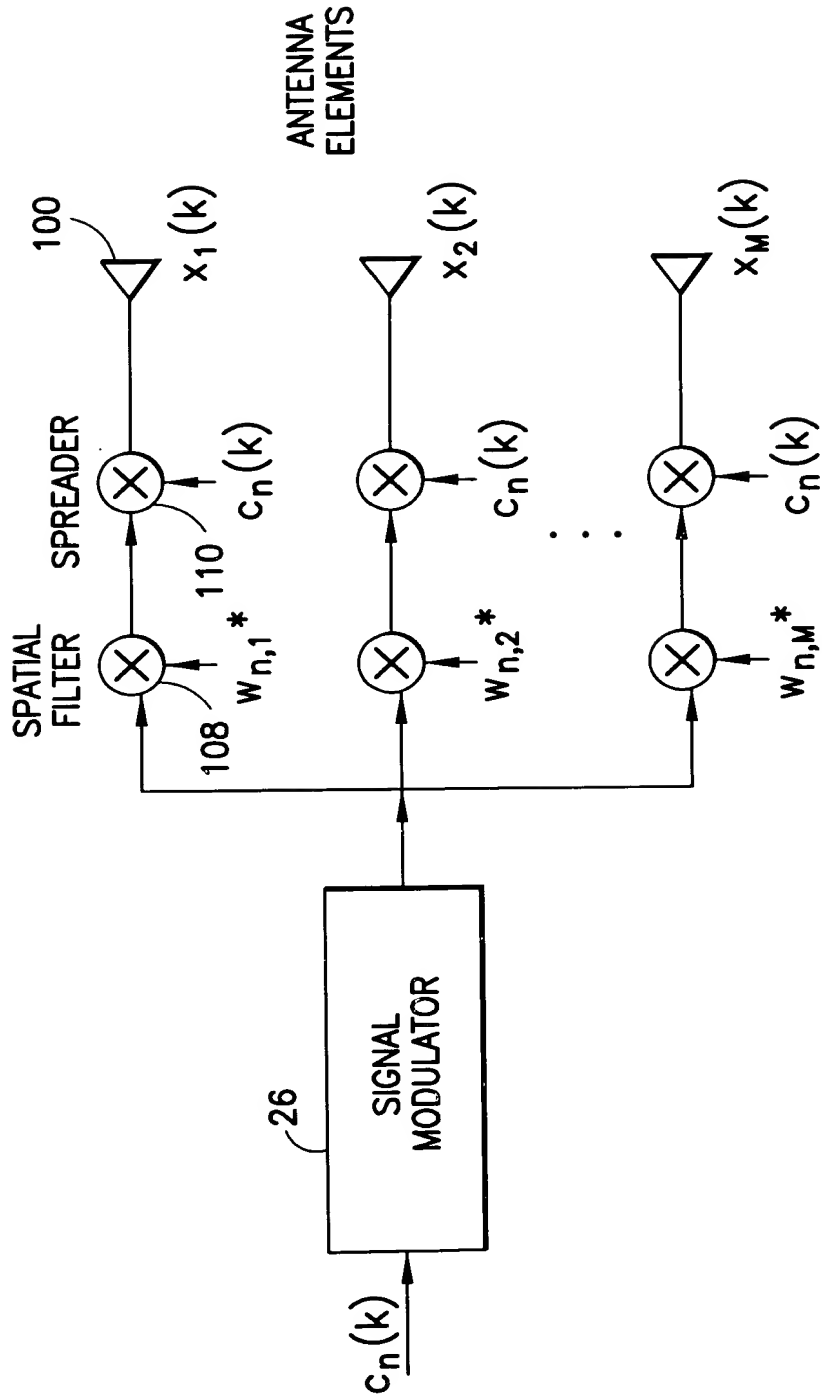
$$v = \begin{bmatrix} \alpha_1 \exp(j\phi_1) \\ \alpha_2 \exp(j\phi_2) \\ \cdots \\ \alpha_M \exp(j\phi_M) \end{bmatrix}$$

FIG.10